WHAT IS CLAIMED IS:

1. An optical multi/demultiplexing circuit with a phase generating function comprising:

an optical multi/demultiplexing device including at least one input section and a plurality of output sections;

an optical delay line device connected to the optical multi/demultiplexing device; and

at least one phase generating device, wherein

said phase generating device generates a phase corresponding to a wavelength or frequency of light in a passband of said optical multi/demultiplexing circuit.

2. The optical multi/demultiplexing circuit as claimed in claim 1, wherein said phase generating device is installed in said optical multi/demultiplexing device or in said optical delay line device.

3. The optical multi/demultiplexing circuit as claimed in claim 1, wherein the phase generated by said phase generating device is given by a function of a wavelength (λ) of light in a transmission wavelength band of said optical multi/demultiplexing circuit or by a function of an angular frequency (ω) of light in a transmission optical frequency band, and wherein the functions are a polynomial consisting of a quadratic or higher order

function.

4. The optical multi/demultiplexing circuit as claimed in claim 2, wherein the phase generated by said phase generating device is given by a function of a wavelength (λ) of light in a transmission wavelength band of said optical multi/demultiplexing circuit or by a function of an angular frequency (ω) of light in a transmission optical frequency band, and wherein the functions are a polynomial consisting of a quadratic or higher order function.

5. The optical multi/demultiplexing circuit as claimed in claim 1, wherein said phase generating device comprises an optical coupler and an optical delay line connected with each other.

6. The optical multi/demultiplexing circuit as claimed in claim 2, wherein said phase generating device comprises an optical coupler and an optical delay line connected with each other.

7. The optical multi/demultiplexing circuit as claimed in claim 3, wherein said phase generating device comprises an optical coupler and an optical delay line connected with each other.

8. The optical multi/demultiplexing circuit as claimed in claim 4, wherein said phase generating device comprises an optical coupler and an optical delay line connected with each other.

9. The optical multi/demultiplexing circuit as claimed in claim 5, wherein an amplitude coupling ratio θ of said optical coupler, and an optical path length difference δl of said optical delay line in said phase generating device, and an optical path length difference δL provided to said optical delay line device in said optical multi/demultiplexing circuit are each optimized such that

said phase generating device generates the phase ϕ equal to a correct phase Ψ, and functions as an optical coupler with an amplitude coupling ratio Θ.

10. The optical multi/demultiplexing circuit as claimed in claim 6, wherein an amplitude coupling ratio θ of said optical coupler, and an optical path length difference δl of said optical delay line in said phase generating device, and an optical path length difference δL provided to said optical delay line device in said optical multi/demultiplexing circuit are each optimized such that

said phase generating device generates the phase ϕ equal to a correct phase Ψ, and functions as an optical

coupler with an amplitude coupling ratio Θ.

11. The optical multi/demultiplexing circuit as claimed in claim 7, wherein an amplitude coupling ratio Θ of said optical coupler, and an optical path length difference δl of said optical delay line in said phase generating device, and an optical path length difference δL provided to said optical delay line device in said optical multi/demultiplexing circuit are each optimized such that

said phase generating device generates the phase ϕ equal to a correct phase Ψ, and functions as an optical coupler with an amplitude coupling ratio Θ.

12. The optical multi/demultiplexing circuit as claimed in claim 8, wherein an amplitude coupling ratio Θ of said optical coupler, and an optical path length difference δl of said optical delay line in said phase generating device, and an optical path length difference δL provided to said optical delay line device in said optical multi/demultiplexing circuit are each optimized such that

said phase generating device generates the phase ϕ equal to a correct phase Ψ, and functions as an optical coupler with an amplitude coupling ratio Θ.

13. The optical multi/demultiplexing circuit as

claimed in claim 9, wherein said phase generating device comprises (M + 1) optical couplers, and M optical delay lines interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

14. The optical multi/demultiplexing circuit as claimed in claim 10, wherein said phase generating device comprises (M + 1) optical couplers, and M optical delay lines interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

15. The optical multi/demultiplexing circuit as claimed in claim 11, wherein said phase generating device comprises (M + 1) optical couplers, and M optical delay lines interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

16. The optical multi/demultiplexing circuit as claimed in claim 12, wherein said phase generating device comprises (M + 1) optical couplers, and M optical delay lines interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

17. The optical multi/demultiplexing circuit as claimed in claim 2, wherein said optical multi/demultiplexing circuit consists of an optical interferometer, and wherein

said optical interferometer comprises (N + 1) optical multi/demultiplexing devices, and N optical delay line devices interposed between adjacent two of said optical multi/demultiplexing devices, where N is an integer equal to or greater than one.

18. The optical multi/demultiplexing circuit as claimed in claim 4, wherein said optical multi/demultiplexing circuit consists of an optical interferometer, and wherein

said optical interferometer comprises (N + 1) optical multi/demultiplexing devices, and N optical delay line devices interposed between adjacent two of said optical multi/demultiplexing devices, where N is an integer equal to or greater than one.

19. The optical multi/demultiplexing circuit as claimed in claim 6, wherein said optical multi/demultiplexing circuit consists of an optical interferometer, and wherein

said optical interferometer comprises (N + 1) optical multi/demultiplexing devices, and N optical delay line devices interposed between adjacent two of

said optical multi/demultiplexing devices, where N is an integer equal to or greater than one.

20. The optical multi/demultiplexing circuit as claimed in claim 8, wherein said optical multi/demultiplexing circuit consists of an optical interferometer, and wherein

said optical interferometer comprises (N + 1) optical multi/demultiplexing devices, and N optical delay line devices interposed between adjacent two of said optical multi/demultiplexing devices, where N is an integer equal to or greater than one.

21. The optical multi/demultiplexing circuit as claimed in claim 14, wherein said optical multi/demultiplexing circuit consists of an optical interferometer, and wherein

said optical interferometer comprises (N + 1) optical multi/demultiplexing devices, and N optical delay line devices interposed between adjacent two of said optical multi/demultiplexing devices, where N is an integer equal to or greater than one.

22. The optical multi/demultiplexing circuit as claimed in claim 16, wherein said optical multi/demultiplexing circuit consists of an optical interferometer, and wherein

said optical interferometer comprises (N + 1) optical multi/demultiplexing devices, and N optical delay line devices interposed between adjacent two of said optical multi/demultiplexing devices, where N is an integer equal to or greater than one.

23. The optical multi/demultiplexing circuit as claimed in claim 21, wherein said optical multi/demultiplexing circuit consists of a Mach-Zehnder interferometer including two of said optical multi/demultiplexing devices, said optical delay line device interposed between said two optical multi/demultiplexing devices, at least one input waveguide connected to one of said optical multi/demultiplexing devices, and at least one output waveguides connected to the other of said optical multi/demultiplexing devices, and wherein

said two optical multi/demultiplexing devices are disposed in left-right symmetry with respect to a middle line of said Mach-Zehnder interferometer;

said two optical multi/demultiplexing devices are a phase generating optical coupler, which functions as a phase generating device; and

said phase generating optical coupler includes four optical couplers, and three optical delay lines each interposed between adjacent two of said optical couplers.

24. The optical multi/demultiplexing circuit as claimed in claim 22, wherein said optical multi/demultiplexing circuit consists of a Mach-Zehnder interferometer including two of said optical multi/demultiplexing devices, said optical delay line device interposed between said two optical multi/demultiplexing devices, at least one input waveguide connected to one of said optical multi/demultiplexing devices, and at least one output waveguides connected to the other of said optical multi/demultiplexing devices, and wherein

said two optical multi/demultiplexing devices are disposed in left-right symmetry with respect to a middle line of said Mach-Zehnder interferometer;

said two optical multi/demultiplexing devices are a phase generating optical coupler, which functions as a phase generating device; and

said phase generating optical coupler includes four optical couplers, and three optical delay lines each interposed between adjacent two of said optical couplers.

25. The optical multi/demultiplexing circuit as claimed in claim 21, wherein said optical multi/demultiplexing circuit consists of a Mach-Zehnder interferometer including two of said

optical multi/demultiplexing devices, said optical delay line device interposed between said two optical multi/demultiplexing devices, at least one input waveguide connected to one of said optical multi/demultiplexing devices, and at least one output waveguides connected to the other of said optical multi/demultiplexing devices, and wherein

one of said two optical multi/demultiplexing devices is a phase generating optical coupler, which functions as a phase generating device; and

said phase generating optical coupler includes (M + 1) optical couplers, and M optical delay lines each interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

26. The optical multi/demultiplexing circuit as claimed in claim 22, wherein said optical multi/demultiplexing circuit consists of a Mach-Zehnder interferometer including two of said optical multi/demultiplexing devices, said optical delay line device interposed between said two optical multi/demultiplexing devices, at least one input waveguide connected to one of said optical multi/demultiplexing devices, and at least one output waveguides connected to the other of said optical multi/demultiplexing devices, and wherein

one of said two optical multi/demultiplexing

devices is a phase generating optical coupler, which functions as a phase generating device; and

said phase generating optical coupler includes (M + 1) optical couplers, and M optical delay lines each interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

27. The optical multi/demultiplexing circuit as claimed in claim 21, wherein said optical multi/demultiplexing circuit consists of a lattice-form filter including first to third, three, optical multi/demultiplexing devices, two optical delay line devices each interposed between adjacent two of said three optical multi/demultiplexing devices, at least one input waveguide connected to said first optical multi/demultiplexing device, and at least one output waveguide connected to said third optical multi/demultiplexing device, and wherein

said first and third optical multi/demultiplexing devices are a phase generating optical coupler, which functions as a phase generating device; and

said phase generating optical coupler includes (M + 1) optical couplers, and M optical delay lines each interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

28. The optical multi/demultiplexing circuit as

claimed in claim 22, wherein said optical multi/demultiplexing circuit consists of a lattice-form filter including first to third, three, optical multi/demultiplexing devices, two optical delay line devices each interposed between adjacent two of said three optical multi/demultiplexing devices, at least one input waveguide connected to said first optical multi/demultiplexing device, and at least one output waveguide connected to said third optical multi/demultiplexing device, and wherein

said first and third optical multi/demultiplexing devices are a phase generating optical coupler, which functions as a phase generating device; and

said phase generating optical coupler includes (M + 1) optical couplers, and M optical delay lines each interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two.

29. The optical multi/demultiplexing circuit as claimed in claim 2, wherein said optical multi/demultiplexing circuit consists of a transversal-form filter.

30. The optical multi/demultiplexing circuit as claimed in claim 4, wherein said optical multi/demultiplexing circuit consists of a transversal-form filter.

31. The optical multi/demultiplexing circuit as claimed in claim 6, wherein said optical multi/demultiplexing circuit consists of a transversal-form filter.

32. The optical multi/demultiplexing circuit as claimed in claim 8, wherein said optical multi/demultiplexing circuit consists of a transversal-form filter.

33. The optical multi/demultiplexing circuit as claimed in claim 14, wherein said optical multi/demultiplexing circuit consists of a transversal-form filter.

34. The optical multi/demultiplexing circuit as claimed in claim 16, wherein said optical multi/demultiplexing circuit consists of a transversal-form filter.

35. The optical multi/demultiplexing circuit as claimed in claim 1, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide

grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

36. The optical multi/demultiplexing circuit as claimed in claim 2, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

37. The optical multi/demultiplexing circuit as claimed in claim 3, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said

first slab waveguide and their second ends connected to said second slab waveguide.

38. The optical multi/demultiplexing circuit as claimed in claim 4, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

39. The optical multi/demultiplexing circuit as claimed in claim 12, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

40. The optical multi/demultiplexing circuit as claimed in claim 20, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

41. The optical multi/demultiplexing circuit as claimed in claim 22, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

42. The optical multi/demultiplexing circuit as claimed in claim 32, wherein one or a plurality of output light waves output from said optical

multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

43. The optical multi/demultiplexing circuit as claimed in claim 34, wherein one or a plurality of output light waves output from said optical multi/demultiplexing circuit are launched into or emitted from at least one of a first slab waveguide and second slab waveguide included in an arrayed waveguide grating, wherein

said arrayed waveguide grating includes array waveguides having their first ends connected to said first slab waveguide and their second ends connected to said second slab waveguide.

44. The optical multi/demultiplexing circuit as claimed in claim 10, wherein said optical multi/demultiplexing circuit comprises two of said optical multi/demultiplexing devices, and said optical delay line device comprises two optical delay lines disposed between said optical multi/demultiplexing

devices, and wherein

one of said two optical multi/demultiplexing devices is connected to at least one of said input waveguides, and the other of said two optical multi/demultiplexing devices is connected to at least one of the first and the second slab waveguides of said arrayed waveguide grating.

45. The optical multi/demultiplexing circuit as claimed in claim 12, wherein said optical multi/demultiplexing circuit comprises two of said optical multi/demultiplexing devices, and said optical delay line device comprises two optical delay lines disposed between said optical multi/demultiplexing devices, and wherein

one of said two optical multi/demultiplexing devices is connected to at least one of said input waveguides, and the other of said two optical multi/demultiplexing devices is connected to at least one of the first and the second slab waveguides of said arrayed waveguide grating.

46. The optical multi/demultiplexing circuit as claimed in claim 16, wherein said optical multi/demultiplexing circuit comprises two of said optical multi/demultiplexing devices, and said optical delay line device comprises two optical delay lines

disposed between said optical multi/demultiplexing devices, and wherein

one of said two optical multi/demultiplexing devices is connected to at least one of said input waveguides, and the other of said two optical multi/demultiplexing devices is connected to at least one of the first and the second slab waveguides of said arrayed waveguide grating.

47. The optical multi/demultiplexing circuit as claimed in claim 11, wherein said optical delay line comprises a path length difference adjusting device, or undergoes path length adjustment.

48. The optical multi/demultiplexing circuit as claimed in claim 5, wherein said optical delay line comprises a birefringent adjustment device, or undergoes birefringent adjustment.

49. The optical multi/demultiplexing circuit as claimed in claim 11, wherein said optical delay line comprises a birefringent adjustment device, or undergoes birefringent adjustment.

50. The optical multi/demultiplexing circuit as claimed in claim 1, wherein said optical multi/demultiplexing circuit is composed of

silica-based glass optical waveguides.

51. The optical multi/demultiplexing circuit as claimed in claim 11, wherein said optical multi/demultiplexing circuit is composed of silica-based glass optical waveguides.

52. The optical multi/demultiplexing circuit as claimed in claim 47, wherein said optical multi/demultiplexing circuit is composed of silica-based glass optical waveguides.

53. An optical multi/demultiplexing circuit module comprising an optical multi/demultiplexing circuit as defined in claim 1 installed in a casing, and having optical fibers held by said casing carry out input and output of an optical signal to and from said optical multi/demultiplexing circuit.

54. An optical multi/demultiplexing circuit module comprising an optical multi/demultiplexing circuit as defined in claim 51 installed in a casing, and having optical fibers held by said casing carry out input and output of an optical signal to and from said optical multi/demultiplexing circuit.

55. An optical multi/demultiplexing circuit module

comprising an optical multi/demultiplexing circuit as defined in claim 52 installed in a casing, and having optical fibers held by said casing carry out input and output of an optical signal to and from said optical multi/demultiplexing circuit.

56. An optical multi/demultiplexing circuit comprising a first optical multi/demultiplexing circuit as defined in claim 1, and at least one second optical multi/demultiplexing circuit as defined in claim 1, said second optical multi/demultiplexing circuit being connected to at least one of outputs of said first optical multi/demultiplexing circuit.